University of Gdańsk

Subject card

Subject name and code	Physical chemistry of complex compounds, PG_00171092						
Field of study	Chemical Business, Chemistry, Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2027/2028			
Education level	Master's studies		Subject group	Optional subject group			
Mode of study	full-time studies		Mode of delivery	at the university			
Year of study	2		Language of instruction	Polish			
Semester of study	3		ECTS credits	2.0			
Learning profile	academic		Assessment form	credit			
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Dagmara Jacewicz					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study	SUM	
	Number of study hours	30		5.0	40.0	75	
Subject objectives	The aim of the course is to familiarize students with: • the kinetic and thermodynamic properties (activation parameters) of coordination compounds of transition metal ions, • factors affecting the durability of complex compounds, • thermodynamic parameters (activation parameters) of chemical reactions, • reaction mechanisms of coordination compounds, • thermal properties of complex compounds (thermogravimetry, differential thermal analysis).						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	Understanding the mechanisms of intermolecular interactions in various states of matter. Assessing the stability of bonds and the reactivity of inorganic and complex compounds based on their structure. To familiarize students with methods of testing coordination compounds in solutions and in solids. Designing experiments aimed at determining the rate of chemical reactions involving coordination compounds of transition metals. Determination of the values of the rate constants of chemical reactions using spectroscopic techniques, research on the mechanisms of isomerization of complex compounds catalyzed by selected metal ions.	[SW4] test/exam - oral or written
[CHEMMU2_W07] Selects experimental and theoretical techniques to the extent necessary to understand the description and modelling of medium complexity chemical processes.	Students will acquire the ability to plan and conduct experiments, selecting appropriate measurement techniques for the physicochemical analysis of complex compounds. 1) Presentation of the method of using basic spectroscopic techniques (IR, FIR, Raman , UV-Vis) to analyze the structure of complex compounds. 2) Use of modern thermal analysis methods combined with the analysis of volatile decomposition products (TG-IR, TG) to test the thermal stability of samples, analyze the composition and purity of complexes, tracking the formation of new complex compounds in the solid phase and identifying the gaseous products of the decomposition reaction.	[SW3] text preparation/written work
[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	The student uses in-depth knowledge of: 1) methods of studying coordination compounds in solutions and in solids. 2) correlation with other natural sciences to explain the course of phenomena encountered in everyday life. 3) solving dilemmas related to performing chemical experiments involving inorganic and coordination compounds.	[SW3] text preparation/written work
[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	Determination of the values of the rate constants of chemical reactions using spectroscopic techniques, research on the mechanisms of isomerization of complex compounds catalyzed by selected metal ions.	[SW4] test/exam - oral or written
[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	Using chemical knowledge in correlation with other natural sciences to explain the course of phenomena encountered in everyday life. The ability to use the acquired knowledge to assess threats and plan ways to counteract threats to human health and the natural environment.	[SU8] observation of student's independent or team work
[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	The student is able to conduct kinetic tests using the stopped-flow method.	[SW3] text preparation/written work

	Course outcome	Subject outcome	Method of verification
	[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	Ability to interpret the received data and present the obtained results. Predicting observations and formulating conclusions resulting from chemical experiments. Justifying the opinions presented.	[SU8] observation of student's independent or team work

Subject contents

Kinetic and thermodynamic properties (activation parameters) of coordination compounds. Permanent and unstable, passive and labile complexes.Factors influencing the stability of complex compounds. Thermodynamic parameters (activation parameters) of chemical reactions.Spectroscopic properties of complex compounds. Reaction mechanisms of coordination compounds, changes in conformational structurereagents.Thermal properties of complex compounds. Thermogravimetry. Differential thermal analysis.

Prerequisites and co-requisites

Basic knowledge of general and inorganic chemistry. Completed course in general and inorganic chemistry.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Performing the experiment	51.0%	15.0%
Reports	51.0%	25.0%
Test	51.0%	60.0%

Recommended reading

Basic literature	S. J. Lippsrd, J. M. Berg, Basics of bioinorganic chemistry, PWN W-wa (1998)L. Stryer, J. L. Tymoczko, J. M. Berg, Biochemia, PWN, Warszawa 2005J M. Cieślak-Golonka, J. Starosta, M. Wasielewski, Introduction to coordination chemistry - PWN (W-wa, 2010)J. Chatłas, A, Katafias, P. Kita, G Wrzeszcz, "Laboratory exercises in inorganic chemistry"; Toruń 1995S. Dietrich, Thermal differential analysis, PWN Warszawa, 1974.S. Gaisford, M. A. A. O'Neill, "Pharmaceutical Isothermal Calorimetry", Informa Healthcare USA, Inc., NY (2007).
Supplementary literature	J. Keeler, Kinetics of Chemical Reactions, University of Cambridge, Departament of Chemistry, 25, IA Chemistry 2002/03.
eResources addresses	

Example issues/ example questions/ tasks being completed

Stability of complex compounds.

Studies of the thermodynamic stability of complex compounds.

Values of thermodynamic parameters.

Work placement

Not applicable

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